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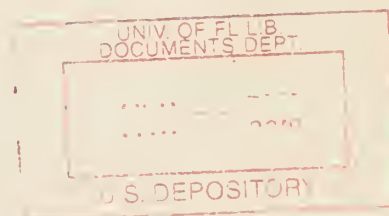
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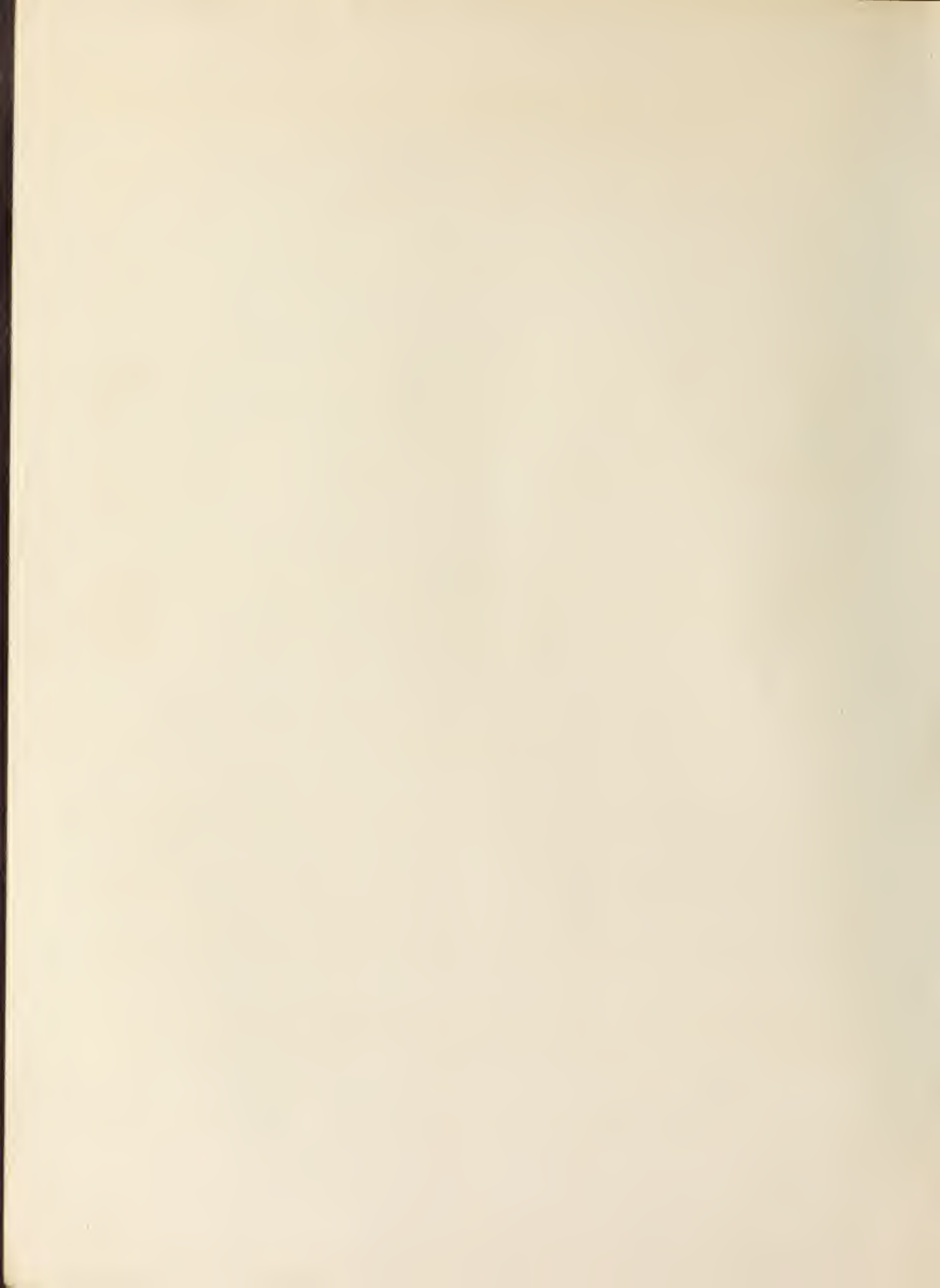


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UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
FOREST PRODUCTS LABORATORY
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In Cooperation with the University of Wisconsin



A METHOD OF SEASONING SMALL QUANTITIES OF LUMBER

By

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The owner of a small quantity of green lumber or logs is often confronted with the problem of seasoning it to a state of dryness suitable for use in furniture, wood carving, or other handiwork. He cannot follow the practice of commercial mills, which employ dry kilns for the purpose, as kilns are too costly. On the other hand, air seasoning outdoors usually does not bring lumber to a sufficient state of dryness for such uses, although it is sufficient for structures that will in use be exposed to outdoor conditions.

Green lumber can be seasoned to the necessary dryness for the purpose by combining outdoor air seasoning with subsequent further drying in a heated room. Studies at the Forest Products Laboratory show that, while this method is essentially simple, it is not without pitfalls for the inexperienced handler of green wood. Unless certain precautions are observed, such defects as checking, warping, and splitting may occur. If reasonable care is exercised, however, well-seasoned lumber can be obtained by the method.

Seasoning Lumber

Various factors must be considered if good results are to be obtained by seasoning. Among these are the size of the lumber to be dried, the use of end coatings to retard end drying, proper piling, and other practices. Above all, thorough seasoning is essential. If wood is not at a uniform moisture content throughout at the time of fabrication, subsequent machining may expose surfaces of unequal moisture content. These surfaces when exposed to a drying atmosphere of low relative humidity, will begin to lose moisture rapidly, unequal drying stresses will develop, and further checking or warping may occur. This may be overcome by coating the article with a moisture-resistant coating and storing in a cool room until thoroughly dry. The best solution, however, is to allow the wood to season until it is at a uniform moisture content throughout before fabrication is attempted.

Size of Lumber

Thin, narrow lumber dries much more rapidly and with fewer seasoning checks than does thick, wide lumber. Warp, however, is increased. Thick planks or timbers containing the pith of the tree, commonly called boxed-heart timbers, are very difficult to dry without checking. Wide boards are more likely to surface check than narrow boards. Thick boards are also more susceptible to checking than thin boards. To obtain fast drying with a minimum of seasoning defects, the lumber should be cut in to boards of about the thickness and width required for final use, with due allowance for shrinkage and warp.

The handling and piling of a large amount of material, of course, involves more time and work if cut into small pieces than if it is in larger sizes. Where a large amount of material is to be seasoned, therefore, two alternative procedures present themselves:

1. Cutting the material to the smallest size required for final use, thereby increasing the time, work, and space required for handling and piling, but reducing drying time and lessening the likelihood of seasoning defects.

2. Drying the material in a larger size than is required for final use and cutting it to the required size after it has reached the desired moisture content. This will decrease the time, work, and space required for handling and piling but the drying time will be increased and seasoning defects will be more likely to develop.

Where ultimate use requires wide or thick stock, seasoning defects can be held to a minimum by cutting the stock into narrow or thin boards and drying these to the desired moisture content, then gluing them together to form a laminated member of the size required.

Bark will retard the drying rate of thick wood items and may introduce a decay hazard under slow drying conditions.

End Coating

Lumber loses moisture much more rapidly from the ends than it does from the sides. This results in end checking, which may become very severe.

To reduce excessive end drying, which will in turn reduce the amount and severity of end checks, lumber -- particularly thick, short stock -- should be end coated with a water-resistant coating as soon as possible after it is cut (1,2).¹

¹ underlined
-Numbers/in parentheses refer to Literature Cited at the end of this report.

Outdoor Piling

All lumber should be carefully piled. In general, outdoor piles should conform to the practice shown in figure 1. A solid foundation constructed so as to permit free circulation of air through and beneath the pile is essential. The front of the foundation should face either toward the south or west if possible, because the front of the pile has no overhanging ends of boards jutting out irregularly and, therefore, is better protected from ^{sun}rain and snow by the stickers (cross-wise strips between layers of boards) and the forward pitch of the pile. The foundations should be high enough so that the pile will slope from front to back 1 inch per foot and still be at least 18 inches above ground level at the back end. Cross supports should be placed under each tier of stickers.

The maximum spacing between stickers should not exceed 4 feet. For 1-inch hardwood lumber, the sticker spacing should be 2 feet or less so as to prevent warping. The front tier of stickers, should project a short distance out beyond the ends of the boards (approximately one-half inch) and for this reason should be slightly wider than the intermediate stickers. The pile should pitch forward 1 inch per foot of height. If the lumber is cut to uniform lengths, the rear tier of stickers should be of the same width as the front tier and should also project beyond the ends of the boards. Where the lengths vary somewhat, the rear stickers may have to be located so as to catch the shortest boards. The long boards will then project beyond the rear stickers.

Stickers for hardwoods are usually 1 by 1-1/2 inches in cross section (front tier of stickers 1 by 2 inches) and long enough to extend across the pile. All material used for stickers should be free of stain and decay so that the lumber will not become infected. Stickers should be at a low moisture content. Vertical flues provided in the pile (fig. 1) are desirable for easily dried species in order to obtain good air circulation and a fast drying rate. The flues should be not more than 2 inches wide for the more refractory species, such as oak and the heartwood of maple.

All piles should be roofed (fig. 1) for protection from the sun's rays and to exclude rain. The roof should be weighted down with heavy weights or extra lumber to reduce warping in the upper courses of lumber.

Piling in Open or Closed Sheds or in Rooms

The method of piling lumber in open or closed sheds or in rooms should conform to the practice shown in figure 2. The same procedures given for outside piling apply. It is not necessary, however, to slope the pile from front to rear or to provide a forward pitch. Furthermore, individual pile roofs will not be necessary, but it would be well to place some weights on top of the piles to reduce warping.

Seasoning Procedure

The initial drying can take place either in the open, in closed or open sheds, or in an unheated room. Some boards should be placed in the pile as samples in such a manner that they can be easily removed for periodic examination and weighing.

Proper moisture content governed by use requirements.--Lumber that is to be used in structures in which it will be exposed outdoors can, as already noted, be air dried to a satisfactory moisture content without being repled in a heated room.

Lumber that is to be dried to a low moisture content, for example, to the 6 or 8 percent required for interior trim, flooring, furniture, or novelties, should first be air dried to a moisture content of about 20 percent or less and then repled in a heated room to attain further drying. The temperature in this room should be maintained approximately 20° F. above the outside temperature at all times of the year. Because many variables, such as size, species, initial moisture content, and climatic conditions, affect the drying rate, it is impossible to state the period of time required to bring the lumber to a moisture content of 20 percent.

Control of drying rate.--Modifications in piling that will reduce the drying rate and minimize checking are (1) decreased spacing between piles; (2) decreased width of vertical flues; (3) increased width of pile; (4) thinner stickers; (5) avoiding the use of stock for stickers (narrow, dry, special stickers are less conducive to checking); and (6) piling stock in a cool room having a high relative humidity.

Methods of determining moisture content.--The simplest method of determining whether the lumber has reached the lowest moisture content attainable by air drying is by weighing the sample boards previously mentioned. As soon as these samples show little or no loss in weight over a period of a week or 10 days of drying under normal summer air-drying conditions, they will have reached a thoroughly air-dried moisture condition. At other times of the year, or during prolonged periods of rainy weather, the rate of moisture loss will be slower and under such conditions the samples should show no appreciable change in weight for 3 to 5 weeks, ^{or longer} before the wood can be considered well air dried.

The oven-drying method of moisture content determination is more nearly accurate but involves the use of special equipment (4).

The lumber should remain in the heated room until dry enough for use (5). The time required will vary from a week or two for small, thin boards to possibly a year or more for large, thick pieces that will be used as carving stock.

Two methods of roughly estimating when the material is at a moisture content of about 7 percent are outlined below.

The first method consists of sawing a piece 1-1/2 to 2 feet long from several wider boards; the cut should be made at least 6 inches from any knot or other defect. From the freshly cut end of the board, cut off a section approximately 1 inch in length along the grain. Measure the width of this section (width of the board) to within 1/64 inch and then place it near a radiator, hot air register, or a stove for at least a day. If no checks appear on the ends and no measurable shrinkage in width occurs, the wood is uniformly dry to a moisture content of about 7 or 8 percent.

To use the second method, mark a line across several of the widest boards with a carpenter's square. Measure the width of each board along this line to the nearest 1/64 inch and record the measurement on the board. Pile the lumber on stickers in a room heated approximately 20° F. above outdoor temperatures. Measure the width of the marked boards from time to time over a period of 3 months or more. When no further shrinkage in their width can be detected, the lumber is roughly at a moisture content of about 7 or 8 percent.

Seasoning Special Items

Special items, such as cross sections of trees, large carving blanks, or boards containing the pith of the tree, must be dried slowly in order to hold seasoning defects to a minimum.

As soon as the material is cut from the log, it should be completely covered with a moisture-resistant coating (1, 2) to prevent rapid loss of moisture with subsequent checking.

A coating that is easy to obtain and apply and yields good results is paraffin. It should be heated to a temperature of from 135° to 155° F., and applied to the material by brush or by dipping. All parts of the wood surface should be covered, and no bubbles should be present. The thickness of the coating will depend on the item to be dried; species extremely susceptible to checking require a thicker coating than do less susceptible species. Some idea of the susceptibility toward checking of the most common woods may be obtained from kiln-drying schedules (3); the species for which low temperatures and high relative humidities must be used in the initial stages of drying in kilns are the ones most susceptible to seasoning defects.

After the coating is applied, the material can be piled on stickers in an unheated shed. The sticker thickness and the flues between the pieces of material can be increased or decreased to hasten or retard drying.

After the material has reached a moisture content of approximately 20 percent, which may take from several months to a year or more, it should be repled for further drying on stickers in an attic or in a room heated

to 20° F. above outdoor temperatures. During this period, samples should be weighed at weekly intervals to determine the drying rate. As soon as the samples have reached a moisture content of 7 to 8 percent, the moisture-resistant coating can be removed.

Material can be dried with the bark on, but during the drying process the bark will, in most cases, become loose and eventually fall off. If it is desired, therefore, to retain the bark on the material for such items as exhibit specimens or novelties, it can be nailed in place with small finishing nails, which will be hard to detect except by close examination.

Winter Versus Summer Felling of Trees

It is a commonly accepted idea that wood is more durable if the trees are felled during the fall or winter months than during spring or summer. This belief probably originated because logs cut in the late spring or early summer are more likely to be attacked by insects and fungi. Seasoning also progresses more rapidly because of low spring and summer humidity conditions, and the logs and lumber may become excessively checked.

If the logs are cut immediately into lumber and the lumber is properly located and piled for air seasoning, the season of the year should be considered only as it affects drying and working conditions.

Many persons also believe that the moisture content of a tree is lower in winter than in summer because the "sap is down." This is not the case. Actually there is very little difference.

Seasoning in the Log Form

Wood in the log form dries slowly, especially through the bark. It is virtually impossible to season logs without decay and without severe surface and end checks. When checks have once started they are very hard to stop, usually increasing in size to the point where losses become excessive.

These checks are due not only to normal drying stresses but also to stresses caused by the fact that the log tends to shrink twice as much around its circumference as it does along the radius.

During the summer months, checking can be retarded by applying a moisture-resistant coating (1, 2) to all freshly cut surfaces. Bark will retard drying and subsequent checking. Therefore, if the bark is removed, the entire log should be covered with a moisture-resistant coating.

If it becomes necessary to store logs for extended periods before cutting them into lumber, they can be kept free of decay and checking by submerging them completely in water.

Literature Cited

1. Coatings that Prevent End Checks. Forest Products Laboratory Technical Note No. 186.
2. List of End Coating Manufacturers and Dealers. Report No. TP-4, prepared by the Forest Products Laboratory.
3. Hardwood and Softwood Drying Schedules. Forest Products Laboratory Technical Note No. 175.
4. Methods for the Detection and Relief of Casehardening Stresses. Forest Products Laboratory Technical Note No. 213.
5. Control of Moisture Content and Shrinkage of Wood. Separate from Forest Products Laboratory Wood Handbook.

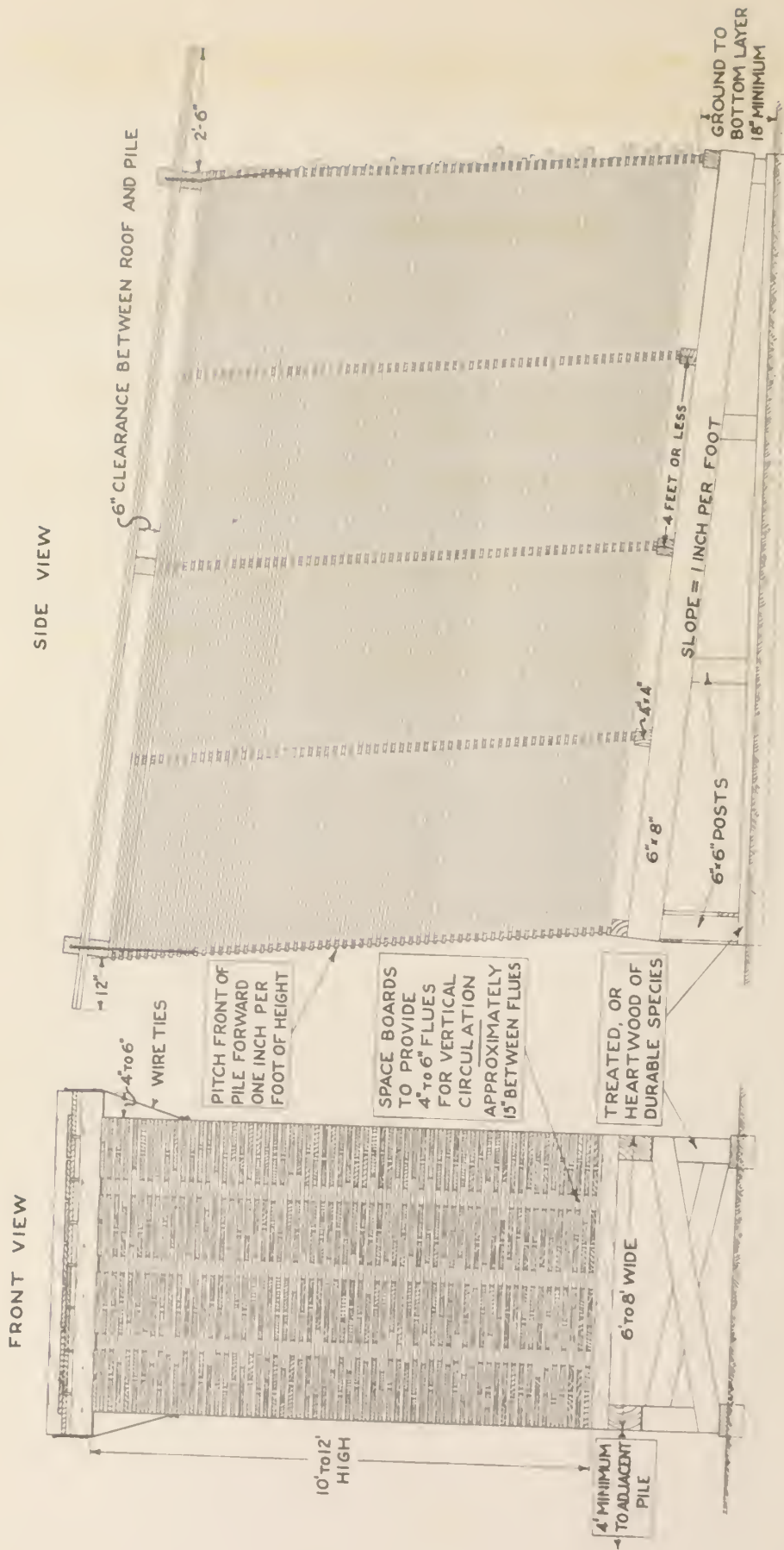


Figure 1.--Essential features in piling lumber outdoors for rapid and uniform air seasoning.

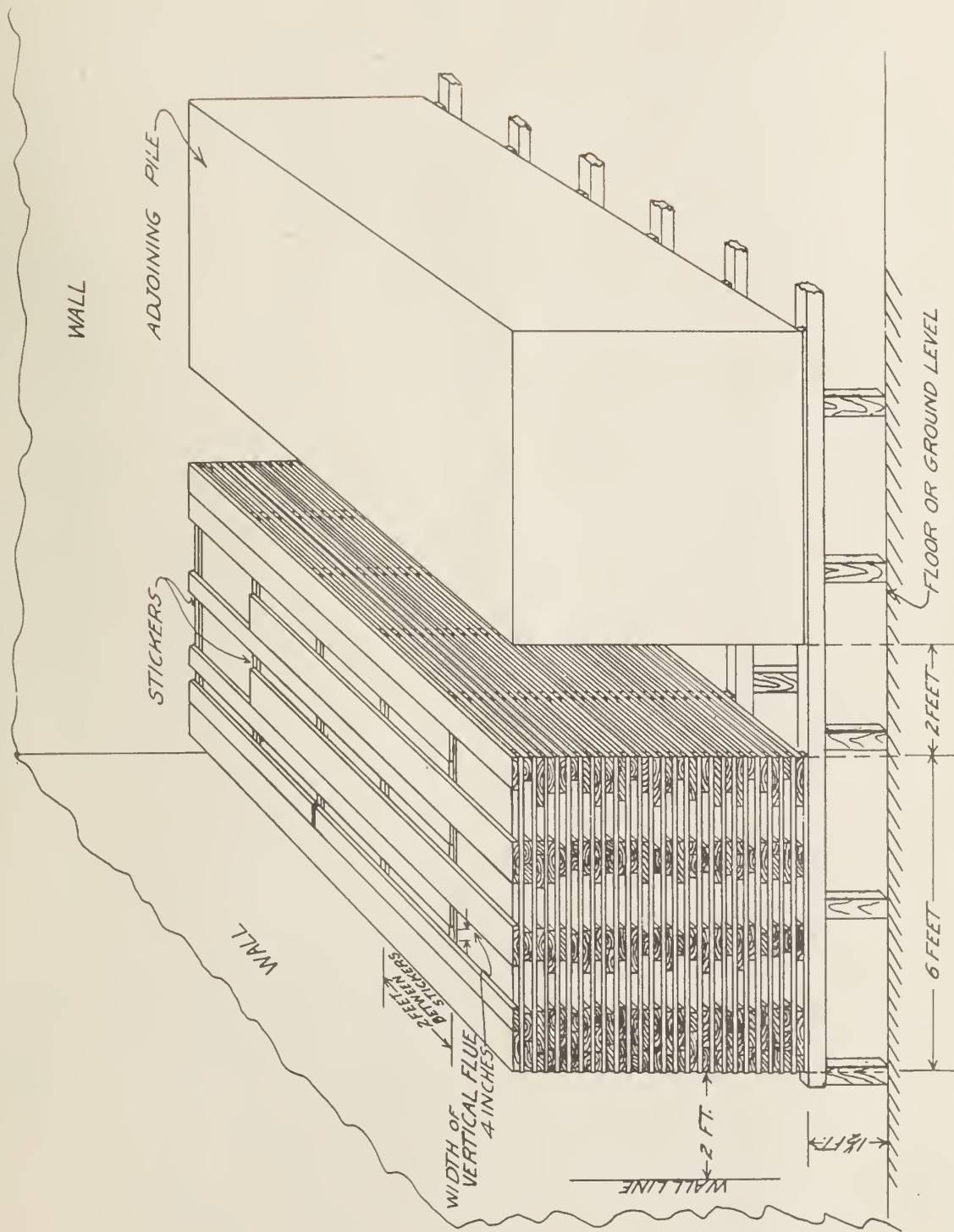


Figure 2.--Essential features of a lumber pile erected for additional seasoning in a heated room.

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